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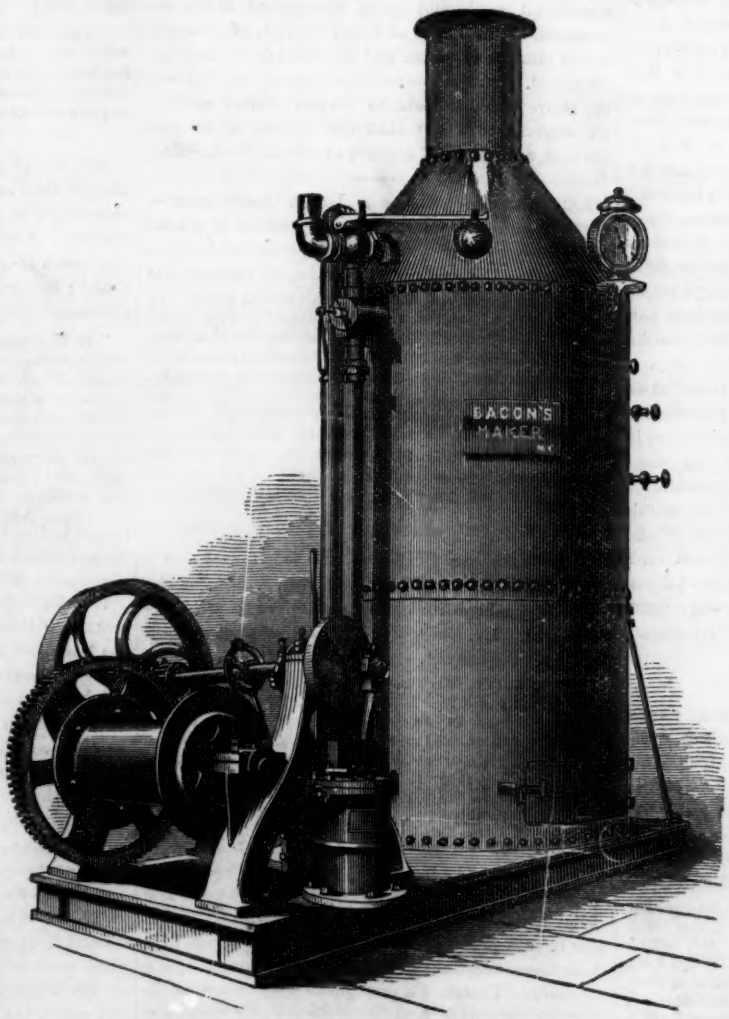
Bacon's Portable Hoisting Engine.

Although this exceedingly compact, effective and easily operated hoisting engine may be put to a large variety of uses, there is none to which it is better adapted than for mining. The desirability of having in the shaft-house a machine that is perfectly adapted to the purpose for which it is used, is too apparent to need any elucidation on our part. Accidents are frequently due to the lack of such machines, and their use is often exceedingly economical, in a pecuniary point of view, over that of some old affair which may be rigged up for the occasion. For use in quarries for handling large blocks of stone, and for raising goods from the holds of ships, in fact wherever heavy weights are to be moved they are well suited.

It is obviously of the utmost importance that the engineer who controls the whole work should have as few rods and levers to move as possible. When a man is trying to raise, swing, and lower a stone weighing several tons, he has no time to give his attention to playing a piano; and some of the engines in use seem really to have as many rods and levers as a piano has keys. In this engine the valve is worked by a link motion, in the same way that a locomotive engine is operated. and the result is, that by working a single lever, the several operations of hoisting, lowering, and stopping are accomplished by the direct action of the steam, and without the intervention of brakes, clutches, and similar contrivances. When the engine is used for handling stone, a small drum, which is worked independently, is placed on the crank-shaft and used for swinging the boom, so that the same man that works the engine can place the stone in position, and in this way the labor of one man is saved.



BACON'S PORTABLE HOISTING ENGINE.

These engines were designed by Mr. Earle C. Bacon, and are manufactured by the Morris County Machine and Iron Company, 36 Courtlandt street, N. Y. They are very substantially made, and as the engine is not connected with the boiler, except by steam and exhaust pipes, there is no danger that the working of the engine will strain the boiler. Moreover, the framing can thus be made much more substantial than in the usual construction, where the engines are attached to the boilers, in which case it is not unusual for the crank-shaft and other parts to get out of line—a thing that never happens with the engine here referred to. Taking all things into considreation, it is clear that this engine must stand, in point of utility, among the first of its class. Before these engines are allowed to leave the shop, steam is raised, and the engine is run for a sufficient length of time to thoroughly test both boiler and engine. If any defect, which is not discoverable by mere inspection of the machine is found, it is, of course, at once remedied, so that purchasers may be sure that they will get perfect machines.

Household Engine.

M. H. Fontaine has presented before the *Societe d'Encouragement* what he terms a *moteur domestique*. The machine placed before the council is heated by gas. It weighs about 160 kilogrammes, and its total height is 0·85 meters. It consumes 200 liters of gas per hour when in operation, and vaporizes one half of a liter of water per hour. The boiler is vertical and tubular, and the fire, after enveloping the steam chamber for superheating, is connected by the base of the engine with the chimney in such manner that, by extending simply the pipes along the support, the machine may be placed at any desired distance from the chimney. The feeding of the boiler does not occur during the working of the engine, but only at one time, the beginning of the day, or at the workman's dinner hour. The capacity of the boiler is calculated for twelve liters of water and six of steam chamber; the heating surface is fifty square inches. A peculiar device is so arranged that the flow of gas is automatically proportioned to the expenditure of steam and the waste of heat by radiation. When the engine is not in operation, the length of the flame diminishes in order that the gas may burn in the quantity required to maintain the tension of the steam at a point to be determined in advance. When the motor is working, the flames elongate, become more active, nd produce all the heat necessary for the formation and transfer of steam consumed by the apparatus. This device consists of a corrugated metallic tube, which must not possess any elasticity in itself, and which is maintained at a point determined in advance. This tube does not vary under the heaviest pressure, but the effect is transmitted from its interior to a counterweight, and the movements of this to the valve govern the admission of gas to the furnace. This acts also upon the generation of steam with the same result as a safety-valve, but without loss of power or steam.

A machine of this kind can be placed in an apartment without danger, occupies but little space, requires but little care, costs but five hundred francs, and burns but two cubic meters of gas in ten hours of continuous work.—*Le Genie Industriel.*

Chemical Repertory,
No. 65.—March 16, 1872.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

187. Colored Candle-Light.—Wax candles are made of different colors, but they all emit a white light. Why may not candles be manufactured, by introducing certain chemicals into the material from which they are made, so as to show a variety of colors, such as blue, red, green, etc.? By arranging such candles in tasteful groups, beautiful effects may be produced in illuminating buildings. If some ingenious chemist will devise a way of embracing a cheap chemical with any of the material used for illuminating candles so as to render the light emitted from them of any desired color he will make a fortune by his discovery.—*Commercial Bulletin.*

This is what we told our chemists several years ago, and still no advance has been made in this direction. If chemicals could be introduced into any safe illuminating material so as to produce a variety of colors, the discoverer would reap a rich harvest for his invention.—*Scientific American.*

[As to the direction in which to seek for this class of discoveries, our suggestion would be to form *substitution-products* with candle-stock compounds, of those elements which communicate colors to flames; in other words, to introduce into the molecular composition of stearic acid, paraffines, or waxes, such elements as *boron, strontium, barium, lithium, etc., etc.* Among such compounds, of which an indefinite variety is doubtless possible, some will be found possessed of the proper degree of stability, fusibility, and volatility to make candle-stock. It will be seen therefore that these problems belong to the most elevated class of organic researches; and that even though our chemists have been "told" several years ago to do it, by *Scientific American*, they are somewhat excusable for not having as yet done it. As to the "rich harvest" promised, we do not believe that any American chemist who should give himself up to this line of investigation, would realize a "red cent." If he engaged himself in the manufacture, however, he might reap a rich harvest of lawsuits. Our boasted American patent law, or rather its generally accepted interpretation by jurists (who are generally as innocent as babes of chemical ideas, and even of the capacity to entertain them), furnishes but very slim and slippery protection to the inventor or adapter. As to the *discoverer*, in his laboratory—the fountain whence all the blessings of our modern civilization flow—he who allows himself to entertain the hope of securing *by patent*, in this country, a chemical *discovery*, however pregnant and portentous, launches himself, in a leaky vessel, on a "sea of troubles." "A hard heart and a good digestion" may sometimes carry him through, but a landing in the cell of a lunatic is a not unlikely termination of the voyage.—Ed.]

188. Soot as a Fertilizer.—[Though fully prepared to accept the following statement as a fact, yet we should like to have some more light, of a chemical kind, thrown upon it. We presume the soot referred to is that from wood fires. If coal-soot has the like qualities, it should be more widely known. There are wide sections in which the manufacture of lampblack from bituminous coals would doubtless be profitable, if its fertilizing qualities are to be rated so high.—Ed.]

Although, almost ever since agriculture has been practised, soot has been known to be a valuable manure, in the nineteenth century there are hundreds of farmers who cannot be persuaded to believe it. It is really as valuable as guano. Take a hogshead of water, and dissolve in it twelve quarts of soot, and you will have a splendid liquid manure for plants. Apply it to the roots, of course, and then watch the result.—*Journal of the Farm.*

189. Nickel and Cobalt Plating without a Battery.—Nickel and cobalt, while comparatively abundant metals, are quite entitled by their properties to be ranked among the "noble" or precious metals. While at least twenty times as abundant as silver, they are far more durable than the latter. Electro-plating with nickel is fast coming into use, and a crop of constructive and factitious patents have sprung up. Chemists have therefore welcomed a recent observation of Stolba, of Prague, that these two metals are very easily and perfectly deposited on wrought iron, cast iron, steel, copper, brass, zinc and lead, by putting them into a boiling neutral solution of chloride of zinc containing some salt of nickel together with a little zinc dust and pieces of sheet zinc. If the zinc solution be acid, the coating is dull. By taking cobalt solution instead of nickel, a coating of cobalt may be produced.

190. Sensitive Flames.—Professor Govi, of Turin, augments the sensitiveness of Barret's singing flames, by placing above the gas jet a piece of wire gauze. At a certain distance, the sensitiveness of the flame is so great that simply pronouncing the vowel *e* at 20 metres distance extinguishes it.

191. A Substitute for Butter.—It may interest many of our readers, in Texas and several countries of South America, to know that the demand for clarified beef suet, as a substitute for butter for cooking purposes, is increasing. It is sold in London for half the price of the best butter; and it will keep good much longer, without the admixture of salt.—*Scientific American.*

[Thrifty American housewives, even in Texas we apprehend, would find much amusement in the announcement, as matter of novel interest, of an application familiar to them, and universal from time immemorial. If our respected contemporary will indicate the above announcement to his own better moiety, we venture to assert that the species of interest aroused will not be of a grave or solemn kind.—Ed.]

192. Carbolic Acid as a Local Anæsthetic.—Carbolic acid possesses wonderful powers as a local anæsthetic. If a portion of skin is covered with a cloth soaked in a saturated solution of carbolic acid for half an hour, and then a streak traced across the surface with a camel's-hair brush dipped in acid liquefied by one-twentieth its bulk of water, the skin may be divided along the course of the streak with a sharp scalpel, quite down to the subcutaneous cellular tissue, without causing any pain. Abscesses, whitloes, and buboes may be opened with great advantage in this manner. Sometimes it is necessary, when making an incision through the integument, to brush out the wound made with some liquefied acid before making the incision deeper.—Dr. J. H. Bill, *Braithwaite's Retrospect.*

193. Vegetable Carbolic Acid.—It is said that a plant called Andromeda Leschenaultii, growing in the Neilgherry hills in India, has been found to yield carbolic acid. Mr. Broughton, the Government medical officer for the district, reports that it is far superior in purity to the ordinary product of coal tar, being less deliquescent and free from any admixture of noxious concomitants. As its cost is far above that of the mineral product, and as the latter can be chemically purified, the discovery has no economical or commercial value; but it is interesting as a botanical and chemical fact.—*Am. Chemist.*

194. Purifying Heavy Oils from Coal Tar.—M. A. Bechamp.—The portion of the series boiling between 110 and 170° C. are chiefly considered. The writer finds that bichloride of tin (anhydrous) is soluble in these hydrocarbons, while its compounds with those bases which may exist there as impurities, are insoluble. Therefore a precipitate may be formed in these by the addition of the bichloride, by which the oil may be thus purified. By this process, the boiling point of the hydrocarbon purified is considerably lowered, and a new hydrocarbon was discovered, boiling between 138° and 140°.

195. On Leucoline Oil, and on the Pure Naphthaline of Commerce.—Ballo.—By treating a quantity of some 30 kilos. of crude naphthaline with dilute sulphuric acid by the assistance of heat the author obtained an oily deliquescent mass, which, having been rectified in various ways, was found to be a mixture of various basic bodies wherein leucoline prevails. This oil yields with iodide of amyle and caustic potassa solution a beautiful violet dye which is identical with that obtained from chinchonin-chinoline; the so-called naphthaline of commerce owes its peculiar odor to leucoline oil, which can be eliminated by treating the naphthaline with bichromate of potassa and dilute sulphuric acid.—*Chem. News.*

196. Carbolic Acid in Powder Form.—Professor C. O. Curtman (*American Journal of Pharmacy*) suggests the use of a dry argillaceous powder, instead of water, as a diluent for carbolic acid. The powder admits of employment in cases where a solution of the acid is inadmissible, and it is said the continuous and regular exhalation of the vapor from the finely divided surface of the powder is preferrable to its more irregular diffusion resulting from the evaporation of an aqueous solution. The powder is also considered safer in the hands of inexperienced persons. Professor Curtman tried a powder containing 20 per cent. of the crude acid as an insectide, and found that it could be used without injury to plants for the destruction of aphidæ, while an aqueous solution containing four per cent. of the acid caused a rose bush to wither and ultimately to die, while the parasites were but partially destroyed. For the powder dry clay is recommended as not entering into any combination with the acid, but acting simply as a mechanical diluent.—*Jour. Applied Chem.*

[Mixtures similar to this have already for several years been in use. From a paper on Anaesthetics read recently by Dr. Endemann, to the New York Lyceum of Natural History, we extract the following:—Ed.]

"The carbolic powder or Egyptian powder, also called the carbolic purifying powder of the American Sanitary Association, has for its basis, clay, which contains admixed a few per cent. of a generally very impure carbolic acid."

197. Sugar for Fuel.—The use of *corn* for fuel, as cheaper than any other attainable, has been a frequent occurrence in snow bound western districts of our country. A still more curious misuse of human food was recently made on the Havana Steamer Moro Castle; her coal having almost given out during a protracted tempest.

"In this emergency, Capt. Curtis determined to try the experiment of feeding the furnaces partially with sugar, of which there were about two hundred and fifty tons aboard. It was found to succeed admirably. Mixed with coal and wood, the sugar made excellent heating material, and Friday night and all day Saturday the furnaces were kept alive with this rather costly fuel. The wood was obtained by cutting up the empty coal bunkers, and the chairs and other furniture of the ship. About $10,000 worth of sugar was consumed before the Highland Lights were made, and all danger was at an end."

198. Relations of Calorific Power of Combustibles to Composition.—During the last sessions of the New York Lyceum of Natural History, a discussion arose on the above subject, in which the present writer startled most of the members present, by announcing his conviction of the total fallacy of the prevalent mode of calculating hypothetically the calorific value of a coal or other combustible, from its elementary constitution. He claimed that, in believing that the same elements in a complex mixture, as well as in a homogeneous compound, even when present in the same centesimal proportions, must needs give the same heat on complete combustion, we ignore all the well-founded and accepted views of molecular dynamics and thermo-chemistry. As the products of complete combustion of carbohydrogen materials were always molecularly identical, that is, carbonic acid and water, the materials themselves must have had identical molecular constitution originally, in order to exert to exert the same amount of internal disturbance, while falling into the same new molecular arrangement. He cited many known facts to support his views, which gave rise to some discussion; and aroused especial opposition from the distinguished President of the Lyceum, Dr. Newberry, who remarked that if Professor Wurtz believed he could substantiate these revolutionary ideas, he should not pause,

night or day, but devote himself exclusively to the task, the importance of the subject being unsurpassed by any other in the range of Science!

With this preamble we introduce the following extract from a report of a recent communication of Scheurer-Kestner and Meunier to the Academy of Sciences, on the Heat of Combustion of Lignites.

"Lignite, the authors found, is distinguished from coal also in this particular—that the latter emits a far greater quantity of heat than that due to the combustion of its elements (carbon and hydrogen). Attention is again called to the fact that it is impossible to judge of the value of a fuel according to its elementary composition; all calculations based upon such data are quite fallacious, and the authors prove this conclusively by referring especially to one of the samples of lignite they investigated."

Siemens' Dynamo-Electric Light.

On the 18th of Dec. 1871, a series of experiments was made at Sheerness with a view of ascertaining the applicability of Siemens' dynamo-electric light to torpedo services in time of war. The scientific combination is produced, as its name signifies, by the application of excessively rapid motion generated from the fly-wheel of a steam-engine to a very powerful set of ordinary galvanic coils in connection with soft-iron magnets. The leather strap from a four horse power engine, encircling a small gun-metal pinion, causes it to revolve with the extreme velocity of 1,600 revolutions per minute, inducing motion in an electric bobbin at the side stream of electricity consequently passes through them. This stream is conducted to a second series of coils, larger and more powerful than the first, which are also in combination with a pinion revolving 800 times per minute, thus intensifying the stream as it passes through them to a very considerable degree. Both negative and positive currents are now alternately given off from another bobbin at the side of the second series of magnetic coils, to the train of insulated wires, which conveys them to the position from which the dynamo-electric light is to be exhibited. Here there is a delicately contrived apparatus for containing the carbon points, between which the light is to be generated, adjusted at the top of the tripod somewhat similar in construction to that of a surveying instrument. At the back of the two carbon points, and slotted vertically to admit of their holders passing through it, is a concave reflector of polished metal, which collects the rays of light into a focus and transmits them in any required direction by means of an adjusting hand wheel below. A minute aperture in the centre of the reflector, precisely behind the junction of the two carbon points, throws a representation of the flame upon a piece of opal glass in a frame fixed at the back of the reflector; and through the agency of another small hand wheel, which causes the carbon points to approach or recede from each other, the flame can be reduced or intensified at pleasure, by simply turning the wheel, care being taken at the same time to keep a watchful eye upon the picture produced, as the withdrawing of the points to too great a distance from each other will extinguish the light. It should have been remarked before that ample means are taken, by lubricating the electrical apparatus, to counteract the evil effects which might otherwise arise from the excessive friction consequent on the rapidity of motion in the several parts.

The object of instituting the series of exeriments which were made to ascertain if it was possible to throw such a stream of light upon an enemy's working parties, engaged in interrupting communications with a line of torpedoes at night, as would render them sufficiently conspicuous to be fired at and consequently driven off. The place selected was the new fort at Garrison Point, Sheerness.

Col. Nugent, R. E., the President of the Torpedo Committee of Great Britain; Col. Galway, R. E., Commandant of the School of Military Engineering at Chatham: Col. Hyde, Bengal Engineers, President of the Torpedo Committe of India, and a number of other engineer officers interested in the matter were present.

The experiments were conducted by a representative of the firm, Messrs. Siemens, Brothers, the inventors of the machine, and were superintended by Lieut. Anderson, R. E, secretary of the Torpedo Committee. The engine and coils were erected in the enclosure of the fort, while the instrument itself was placed in one of the massive embrasures piercing its sides. No sooner was steam gotten up and the order given to go ahead, than the burring noise of the machine indicated that electricity was being rapidly generated, sparks and stars of vivid blue light being given off at the various joints. Another instant, and a vivid stream of light shot across the sea to a number of of ships lying in the offing at a distance of about two miles, lighting them up with the brilliancy and distinctness of broad moonlight.

The effect was magnificent. Clonds of mist, rendered visible by the intensity of the rays shooting through them, rolled across the broad field of bright light from time to time, not, however, interrupting the view in their progress. By shifting the direction of the rays laterally, each object in turn comes within the compass of the portion of horizon rendered clear. In fact, it was sufficiently apparent that no objects of any appreciable size, such for instance as an enemy's boats, could come within a mile or more of one of Siemens's dynamo-electric instruments in operation without being rendered conspicuous to any battery in the vicinity, and consequently involving to themselves the most imminent danger. Hence the result of the experiments may be pronounced a success; whether, however, a corresponding effect might not be obtained by a succession of parachute lights thrown from a rocket or mortar, is quite an open question.

A Lecture on Water.

By CHARLES F. CHANDLER, PH. D.,

At the Academy of Music, New York, Jan. 20, 1871.

[Reported stenographically by S. J. Borrows, Esq.]

[Abstract by the Editor of this Journal.]

[Continued from page 98.]

METALLIC IMPREGNATIONS.

Water is frequently rendered impure by the metallic tubes used to conduct it. Organic matter, nitrates, chlorides, etc., and in some cases even pure water, attack certain metals, causing them to dissolve.

COPPER.

Cases of sickness have occurred, caused by water drawn through copper pumps, copper having been actually detected in the water.

LEAD.

Lead is by far the most common material used in the construction of service pipes for water, and this metal is the one which is the most easily dissolved by water, and at the same time most poisonous in minute quantities, being a cumulative poison. A celebrated case occurred in the royal family of France, at Claremont, where one-third of the persons who drank of the water were affected. This water contained only one-tenth of a grain of lead in a gallon. As little as one-hundredth of a grain of lead to the gallon, has been known to produce palsy in persons who habitually drank it. It is a great pity that the peculiar advantages of lead as a material for the manufacture of water pipes, are more than counterbalanced by the danger of lead poisoning.

When the Croton water was first introduced into New York, it contained considerable lime derived from the mortar of the recently constructed aqueduct. This prevented, to a considerable extent, the action of the water on the lead pipes, and it was stated at that time, that no lead was taken up by the Croton water, but as the lime of the mortar became carbonated, the water ceased to dissolve it, and began to act upon the lead pipes. Recently, the attention of the Metropolitan Board of Health having been called to the frequent cases of chronic lead poisoning which occurred in the city, I was requested to investigate both the Croton water, and the various hair tonics, invigorators and washes in common use, with the view to discovering the probable cause of the poisoning. For the benefit of the ladies I will say, that the latter preparations almost invariably contained lead, some of them in very large quantities, and that their efficiency in coloring the hair, and restoring its original color, depends upon the proportions of the poisonous metal they contain.

If they will glance at the diagram on the wall, they will see the number of grains of lead which I obtained from one fluid ounce of each of several of the more popular cosmetics of this character.

Grains of Lead in one Fluid Ounce.

Clark's Distilled Restorative for the Hair	0.11
Chevalier's Life for the Hair	1.02
Circassian Hair Rejuvenator	2.71
Ayer's Hair Vigor	2.89
Prof. Wood's Hair Restorative	3.08
O'Brien's Hair Restorer America	3.28
Gray's Celebrated Hair Restorative	3.29
Phalon's Vitalia	4.69
Ring's Vegetable Ambrosia	5.00
Mrs. S. A. Allen's World's Hair Restorer	5.57
L. Knittel's Indian Hair Tonique	6.29
Hall's Vegetable Sicilian Hair Renewer	7.13
Dr. Debbett's Physiological Hair Regenerator	7.44
Martha Washington's Hair Restorative	9.80
Singer's Hair Restorative	16.39

Examinations were also made of Croton water, which had been in contact with lead for different lengths of time, under usually occurring circumstances, of which the following are the results:

1. A gallon of Croton water from a lead-lined cistern, in which it had stood several weeks, was found to contain 0·06 grain of metallic lead.

2. A gallon of water which had remained six hours in the lead pipes of my residence yielded 0·11 grains metallic lead, a considerable portion of which was visible to the eye, in the form of minute white spangles of the hydrated oxycarbonate ($PbO,HO+PbO,CO_2$).

3. Water drawn from one of the hydrants of the School of Mines laboratory, in the middle of the day, when the water was in constant motion, yielded traces of lead. This water reaches the school through about 100 to 150 feet of lead pipe.

These results indicate the source of many hitherto unaccountable cases of lead poisoning, and are of a character to alarm the residents of New York, and to lead them to adopt precautionary measures for protection against this insidious cause of disease.

Certainly no pains should be spared to impress upon servants the importance of allowing the water to run for a few minutes before taking it for drinking or cooking purposes, specially early in the morning, after the water has stood all night in the pipes. The habit of filling the kettle from the boiler, or of using water from the boiler for any purpose except washing, is very dangerous.

My second experiment explains a case which recently occurred in New York. An elderly gentleman was completely prostrated with paralysis or palsy. His physician at once suspected lead poisoning from his symptoms, and instituted inquiries which developed the fact that the patient had been using wheaten grits for dyspepsia, and that the first duty of the cook in the morning had been to soak them, preparatory to boiling them. She had therefore used daily the water which had stood all night in the pipes. The occurrence of a considerable portion of the lead in experiment No. 2, in suspension, instead of solution, is no additional argument for the use of filters, though it will of course be useless to employ them unless they are frequently reversed, that they may be cleansed.

Manufacturers of lead pipe have frequently appeared in the New York papers with theoretical arguments to prove that the Croton water cannot possibly dissolve lead; but I believe that my simple facts outweigh folios of theory.

Dr. Lardner made an elaborate statement to his audience why a steamer could never cross the Atlantic ocean; but before the audience dispersed his conclusive argument was completely shattered by the scream of the newsboy, "Arrival of the steamer from New York!"

SUBSTITUTE FOR LEAD.

Various substitutes have been suggested for lead, as for instance wrought iron, which generally makes the water rusty; galvanized iron, which is said to be objectionable on account of the zinc which is readily taken up by the water, rendering it unwholesome, numerous cases of zinc-poisoning by these pipes having occurred in New England, where this pipe is much used; gutta percha, which is not durable; brass*, which I fear is not wholesome; glass, porcelain, etc. None of these substances possess the peculiar flexibility, softness and other desirable qualities of lead, which makes it so easy to cut and bend and join and fit pipes of this metal. The problem, therefore, is to provide a pipe which shall possess all the good qualities of lead, and be free from the one great objection, namely, the danger of lead poisoning from its use. This has been achieved by the invention of the *lead incased block tin pipe*, or as some call it, the *tin lined lead pipe*.

TIN LINED LEAD PIPE.

This is essentially a pipe of pure tin, surrounded by a lead pipe to which it is firmly and perfectly united by an intervening alloy or solder composed of the two metals. The water comes in contact with the pure tin surface only, and cannot therefore be contaminated with lead. That tin is harmless, it is hardly necessary to argue, as vessels covered with this metal are extensively used for culinary purposes throughout the civilized world. It has been argued that commercial tin contains arsenic; but if we can consume daily, with

* I am informed that Prof. Appleton of Brown University, has found both copper and zinc in water supplied through a brass pipe.

impunity, food which has been boiled and stewed in tin pans, notwithstanding the arsenic contained in the tin coating, I think we need have little fear of poisoning from the trace of arsenic which may possibly be present in the tin lining of this sanitary pipe. My conviction that the tin lined pipe fully realizes all that is desired as a service pipe for aqueduct water, is not based upon theory alone, as I have tested it side by side with ordinary lead pipe, and have found that waters which take up from one to two-tenths of a grain of lead per gallon from the lead pipe, are not perceptibly affected by remaining for considerable lengths of time in the tin lined pipe. It was at first thought that the expense of the tin would interfere with the introduction of this pipe, but it is found in practice that the great strength of the tin makes it possible to reduce very materially the thickness of the pipe, so that the tin lined pipe need not weigh more than half as much to the cubic foot as lead pipe of the same calibre in order to possess an equal degree of strength.

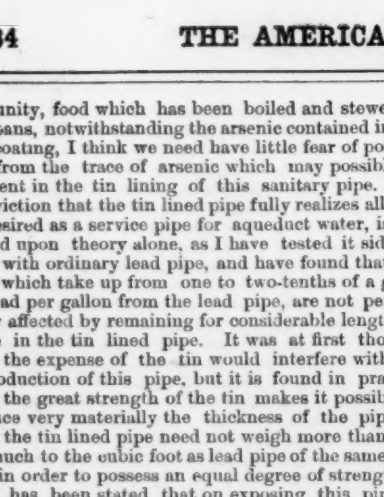
It has been stated that on exposing this pipe to water, galvanic action would take place, by which rapid corrosion would be produced; but Mr. Cassamajor has shown that as a matter of fact no such galvanic action occurs. When this pipe is used for bringing water from a well it is of course important not to allow it to pass into the water, as the exterior pipe of lead would contaminate it, as readily as though the tin were absent. In such cases a few feet of block tin pipe should be used in the well to deliver the water to the tin lined pipe.

I do not think this pipe is well adapted for hot water, as tin is very sensitive to heat, and should recommend that its use be confined to cold water. This is no objection, as the hot water from boilers should not be used for any purpose save washing.

The subject of pure water is so important, and so much nonsense has been published with regard to lead and tin lined pipe, that I think you will be glad to have me devote a few minutes more to this topic.

The process by which the tin lined pipe is manufactured is very simple and it secures not only a continuous internal tube of pure tin, of uniform thickness, but it insures a firm and perfect union of the two metals, by an intervening solder. That the solder actually exists between the tin and lead is easily shown by carefully heating a piece of the pipe half an inch long. The solder being more fusible than either of the metals united by it, melts first, making it possible to shake out the tin tube intact. This union of the metals by solder prevents any separation, and also renders the penetration of the water between the metals impossible. Here is a mass of lead and tin as it exists in the cylinder from which the pipe is expelled by hydraulic pressure. You see the lead and tin flow out together in an even ratio, producing an uniform lining.

Fig. 1.



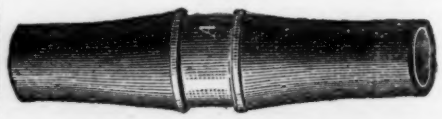
SECTION OF LEAD AND TIN IN THE CYLINDER.

That one may recognise this pipe from the outside, it is drawn with four raised ribs as shown in this sec-

Fig. 2.

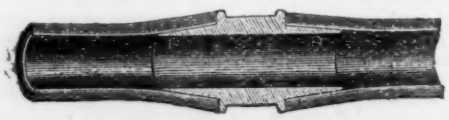
tion. Some difficulty was at first experienced in making joints on this pipe; the plumbers were careless and heated the solder hotter than was necessary, and thereby melted the lining in the pipe. This difficulty has been obviated by the tinned brass joints of which I have here a variety of specimens.

Fig. 1.



JOINT WITH THE PIPE ATTACHED.

Fig. 2.



SECTION OF JOINTED PIPE.

Fig. 3 is a joint ready for use, before the pipes are attached. It is composed of brass, heavily tinned within and without.

Fig. 3.

THE JOINT.

Fig. 4.

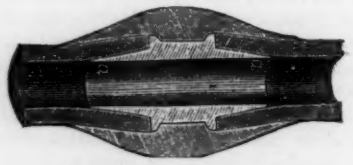
THE EXPANDER.

Fig. 5.

THE SOLDERING TONGS.

The ends of the pipe are enlarged on the expander Fig. 4, and after they have been carefully forced upon the conical ends of the joint, a union of the solder is effected by the application of the hot copper tongs shown in Fig. 5. Thus a simple, expeditious method has been devised for joining this pipe, which meets all the objections raised by the plumbers, except perhaps that they will have no excuse for charging for several pounds of solder for every joint. If one fears this joint is not sufficiently strong it is very easy to cover it with a "wiped joint," as has been done in this specimen.

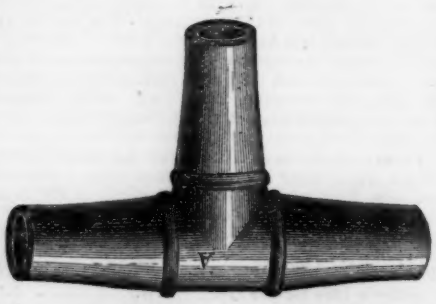
Fig. 6.



JOINT REINFORCED WITH SOLDER.

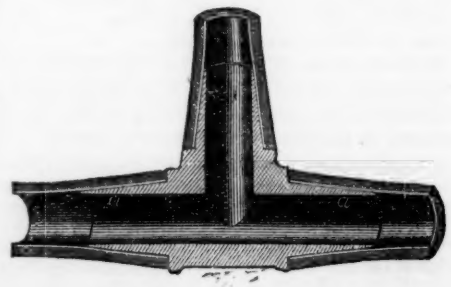
Here is a T joint with the pipe attached.

Fig. 7.



T JOINT WITH PIPE ATTACHED.

Fig. 8.



SECTION OF A T JOINT WITH PIPE ATTACHED,

and this is a joint for the attachment of a faucet.

Fig. 9.

A FAUCET JOINT.

Every difficulty seems thus to have been met, so that we have reason to believe that the poisonous lead pipe will soon be generally replaced by this sanitary pipe, which possesses all its advantages, without its dangers.

ANOTHER IMPORTANT APPLICATION OF WATER.

We have now fully discussed the application of water to manufacturing and domestic purposes. There is, however, another use to which we have not alluded. I do not refer to the use of water for navigation, either slack water, river or marine, nor yet to the use of this important fluid for the extinguishing of fires, but to one of the most lucrative applications. I refer to the adulteration of milk. Investigation has shown that for every three quarts of milk brought into the city of New York, the milkmen serve out a full gallon to their customers, an average of one quart of water being added to every three quarts of milk.

This little watering operation nets the milkmen of the city, or the farmers, as the dilution is largely effected before the milk reaches the city, the nice little sum of $10,000 a day or $3,000,000 per annum. I know of no application of water which brings in so large a return in so small an area. When the milkmen heard that the health department was investigating the subject, with the view to preventing the introduction of diluted milk into the city, they expressed themselves highly delighted, averring that at present the dairymen water the milk so extensively that there is no chance left for them, and that they think that it is time they had their turn.

[To be continued.]

Astringent Legislation.

[We take the following announcement from the *Times*. All the comment we have to make just now, is that the Honorable the Legislature of the State of New York, might do well to read the Constitution of their State. They might then discover therein a clause interfering in a slight degree with their proposed interference concerning what they here propose to meddle with In fact, if our legislators are so very firmly convinced that light can be so very cheaply furnished to us, possibly it might be just as well that they should legislate the existing Gas Companies out of existence, as below, and take the thing into their own hands. *Lux a non lucendo* is a thing which they would then have to take the responsibility of realizing. *Pons asinorum*, we fear they have long since overcome.]

GAS REFORM.

A very stringent bill, introduced originally by Mr. Moulton, has been on the file some weeks, the object of which is to compel gas companies to improve the quality of gas furnished, and to put an end to some of their most common abuses. The bill was before the

Committee of the Whole again this morning, and, after some amendment, was ordered to a third reading. As amended, it is as follows:

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. All companies now organized, or to be hereafter organized, for the purpose of manufacturing illuminating gas, under the act passed February 16th, 1848, and actually engaged in the manufacture and sale of gas for lighting streets and public and private buildings, shall be required to furnish, at the meters of consumers, gas of not less than fourteen and one half candle power, the standard of measurement being a spermaceti candle, burning one hundred and twenty grains per hour, which gas shall contain not less than ten per cent. of condensable matter, other than carbonic acid, carbonic oxide, bisulphide of carbon, sulphuretted hydrogen, cyanogen, ammonia, or sulphurous acid.

Sec. 2. Such gas shall also contain in no form or combination more than thirty grains of sulphur and ten grains of ammonia per thousand feet, nor more than one-tenth of one per cent. of carbonic acid or carbonic oxyd, one half of one per cent. of nitrogen and two per cent. of atmospheric air.

Sec. 3. The pressure at the meters of consumers shall be maintained at an average of nine-tenths of an inch meter pressure between the hours of 6 P. M. and 11 P. M. each day, and in no case shall such pressure fall below eight-tenths of an inch water pressure.

Sec. 4. Every failure or omission on the part of any gas company to comply with the provisions of the foregoing sections shall, unless proved to the satisfaction of the court to be from causes beyond the control of the company, be deemed liable and shall be punished by a fine against the company offending, of not less than five hundred nor more than one thousand dollars.

Sec. 5. Every Inspector of Meters who shall make any false or fraudulent certificate of inspection, or shall affix his seal to any gas-meter, knowing the same to be imperfect, shall be deemed guilty of a misdemeanor, and on conviction shall be punished by fine, not to exceed $2,000, or by imprisonment not to exceed one year, or both, in the discretion of the court.

Sec. 6. Every consumer of gas may, at his option, procure the inspection and testing of the gas furnished through his meter by any skilled chemist. Upon the certificate and affidavit of such chemist showing that such gas is deficient in quality or in pressure as required by the foregoing sections 1, 2, and 3, such consumer may make complaint before any Grand Jury against the company furnishing such gas. The Grand Jury shall, upon the proofs of such deficiency as shall appear by the examination under oath of the chemist, making such inspection and test, proceed to indict such company as for a misdemeanor.

Sec. 7. Hereafter it shall not be lawful for any gas-light company to charge any deposit for use or rent of any gas meter, nor any cost for repairing or keeping the same in order. And it shall be a misdemeanor for any gas company to refuse or neglect to supply gas to any person or persons who may apply for a supply of gas, by reason of the failure of any preceding consumer to pay for gas consumed on the same premises.

Sec. 8. All acts or parts of acts inconsistent with this act are hereby repealed.

Sec. 9. This act shall take effect immediately.

Sewer Gas and Contagious Diseases.

A short time ago the HERALD pointed out the danger of contagious disease resulting from the pneumatic diffusion of sewer gas in our houses. The late report of the City Sanitary Inspector on spotted fever and other contagia, fully sustains our view that this evil must be remedied in the construction of modern dwelling houses, before we can ever hope to escape the scourge of the pestilence.

In the five cases on one floor, cited by Dr. Morris, it is a remarkable and conclusive fact, that each case commenced with an attack in the night, when ventilation was closed, and the foul exhalation from the sewer pipes was free to infuse its poison into the sleeping victims. Nor is this danger confined to the abodes of the poor and those enfeebled by hard toil and insufficient or unwholesome food, but insinuates itself into our most luxurious chambers and attacks all classes. Every variation of the atmospheric level and every strong wind that blows serves to waft the germs of disease and death into the pipes which communicate with our bathrooms and bedrooms; and, as the *Herald* has before shown its readers, their houses are in direct connection by the common sewer with the foulest and most fetid nests of contagion in the most abandoned parts of the city. The Health Officer says:

"Experience has convinced myself, as well as the corps of health inspectors, that to these direct causes may be attributed by far the larger proportion of typhoid and other fevers of a sthenic and asthenic character, and that contagious diseases here find their most active factors."

It is well known to scientific men that gases and odors move through other gaseous bodies and air without mixing or becoming diluted, so that Coleridge wittily said he detected in the city of Cologne a hundred distinct smells, and it is because of their immiscibility that poisonous sewer gases are peculiarly dangerous; and it is almost idle to employ an army of scavengers to clean the streets when we take no precaution against the enemy within doors. It may be hard ever to teach our architects and house builders their technical duties; but, to use the words of the Sanitary Inspector, "house drainage, tight-jointed pipes, efficient traps in waste and sewer pipes, with a free outlet for gases by a continuous open-mouthed sewer pipe, beyond and above the roofs of houses," are much greater necessities than the thousand and one so-called improvements in the furnishing and equipping of hotels and private residences.—*Herald.*

Current Gas Topics.

The *Albany Times*, of the 2d inst., remarks: "The Commissioner of Public Works in New York city, has come to the same conclusion which private gas consumers long since arrived at; that the prices now paid for gas are excessive, especially if the prices paid for labor and domestic and imported coal, at the present day, are compared with those paid during the period of our late civil war, when the prices were so raised. and he has invited Mr. C. K. Garrison, the President of the New York Mutual Gas-Light Company, the new organization there, to a consultation as to whether some mutually beneficial result to the new company cannot be obtained. The old gas monopolists are beginning to feel the power of competition, and will soon be compelled to reduce their charges. In another year, we may hope there will be competition enough to bring the Albany Gas-Light Company to a proper sense of the public demand for better and cheaper gas."

Below is the communication of the Commissioner of Public Works, alluded to in the foregoing:

DEPARTMENT OF PUBLIC WORKS,
COMMISSIONER'S OFFICE. 237 BROADWAY.
NEW YORK, February 29, 1871.

C. K. GARRISON, Esq., President New York Mutual Gas Company:

Sir: Ascertaining that the New York Mutual Gas Light Company will be able to furnish gas to the city of New York to at least a limited extent by the first day of April, and in an increased amount continually thereafter, and inasmuch as it is the ardent desire of the Department of Public Works to economize the expenditures of the city wherever the same will be consistent with the public interest, and believing the amounts now paid for lighting the public lamps by the several gas companies to be excessive, especially if the prices paid for labor and domestic and imported coal at the present day are compared with those paid during the period of our late civil war, when the prices were so raised, and more especially where, considering the important privileges enjoyed by all the companies in the right to lay their mains in the public streets, etc., for which no allowance is made the city over and above the charge per thousand feet exacted of private consumers, leads me to solicit from your company, through you, a consultation as to whether some mutually beneficial result to your new company and the city, which in this case I represent, cannot be obtained. Please, therefore, at an early date communicate with me as to when an interview can be had. Respectfully,

GEO. M. VAN NORT,
Commissioner of Public Works.

The *New York Herald* of the 3rd inst., contains the following, being a sequel to the letter of Commissioner Van Nort, published in the last issue of this Journal:

At the consultation yesterday between Commissioner Van Nort and the representatives of the several gas companies of the city there were present: The Presidents of the Metropolitan and New York Mutual Gas Light Companies. The representatives of three companies were not present owing to prior engagements. Those present evinced a desire to meet the views of the commission as far as possible.

The commission submitted for consideration a statement of the cost of lighting each of the public lamps per annum, as follows:

New York Gas-Light Company, $45; Manhattan, $53; Metropolitan, $52 87; Harlem, $53; which includes the expense of lighting, cleaning, extinguishing and replacing the broken glass, the city furnishing the glass to each company for this purpose. This gives an average cost of $50 25 for each light per annum, of which there were on January 1, 18,151, making an aggregate cost of $912,088 for lighting the city. To this must be added the expense of replacing, resetting, connecting and fitting old and new lamp posts. Each lamp burns per year 3,833½ hours, consuming per hour three cubic feet of gas for each lamp per annum is 11,500; price per cubic foot, $3; total amount if charged per 1,000 feet, $34 50; add for lighting and extinguishing each lamp, say $4 50; total for each lamp, $39.

These prices indicate that the sum of $45 paid the New York Gas-Light Company would seem to be a large price per each light, though this is the lowest of all the companies.

[The Bosh we waste space on below, is from one of our city Dailies.—ED.]

There is much of ignorance underlying the clamor found from time to time in the daily press, relative to what it calls poor gas and exorbitant charges. One good result follows these outbursts, which is that scientific men are provoked into uttering words of practical good sense. We quote from the *Journal of Applied Science* the following in regard to what it urges as the true method by which gas should be measured to the consumer:

"The custom of paying for gas by the cubic foot, without regard to its illuminating power, is like buying all cloth at a uniform price per yard, without any questions as to the fineness of the wool. No one would like to pay as much for shoddy as for cassimere, and yet shoddy gas is the principal article furnished to customers, while the price actually paid calls for the best gas that can be made. It is surprising that a monopoly of such a monstrous character should be permitted to maintain itself so many years in an enlightened community, and the cause must be sought for in the want of confidence in any legislative enactment to correct the evil. The people have preferred to be heavily taxed rather than to get into any altercation on the subject; but now that honest days appear to have dawned upon us, it seems to be a good opportunity to call for more light to those who sell that commodity in the shape of gas. The city companies should be compelled to furnish gas of a prescribed density and fixed candle-power.

"Some London companies pride themselves on keeping up the illuminating power of their gas to the maximum standard of fifteen-candles, and in twenty-two English works the gas from the best coal ranges from twelve to fourteen per hour. It is difficult to say what the average in New York may be, but from some observation made by ourselves with Bunsen's photometer we are disposed to put it, in cold weather, to below ten candles. Besides the loss to the consumer in the amount of light afforded by a poor gas, there is another difference which tells in favor of the company. Assuming the specific gravity to be 5, and that of a rich gas to be 7.20, the former will pass through the burner much faster than the rich, and increase the bill of the consumer from 30 to 50 per cent., without any corresponding increase in the photometric power of the gas. There ought to be a fixed standard, say sixteen candles, prescribed by law, and an inspector appointed to see that the companies comply with it, and in case of any breach of contract a heavy penalty should be imposed. It is not darkness that we want, but light, and for the sake of the thousands of poor sewing women and workingmen something should be done to save money and eye-sight. Let quality, not quantity, govern in this matter. We have plenty of gas but not enough light."

Among the many plans which have been, of late, devised for utilizing the sewage matters of towns, not the the least interesting is "Hickey's system of conservancy by carbonization." The Indian government has granted some money for testing the efficacy of this plan. Mr. Hickey proposes to decompose the sewage matter by heat in closed retorts, to employ the gas thus formed for illuminating towns, and use the residuary coke mixed with the ammoniacal liquors, collected in the gas retorts, as a valuable manure. According to the report of the experiments made, the gas produced was equal to 1.156 cubic feet for each 1,000 of population, but its illuminating power was inferior to that of coal gas.

Copper gas pipes are not often used in this country till it is important to intimate a danger in the use o them. The *Journal de l'Eclairage* sttes, that on the occasion of a workman cutting through such a pipe with a file an explosion occurred, by which he was burned. It appeared, upon examination, that the pipe was coated with a black matter, which was found upon analysis to be an acetate of copper, liable to explosion between 203 and 248 degrees.

Yokahama, Japan, is to have a gas works. The company is to be of native formation. The works are to be sent from Glasgow, Scotland.

The St. Louis Gas Company have reduced the price of gas from $4 to $3 75 per thousand feet.

The Petroleum Ring.

OPPOSITION TO A GREAT MONOPOLY.

Great exasperation exists in all regions interested in the trade in petroleum oil, on account of the exactions of the "Southern Improvement Company," under which name a great railroad monopoly has been formed, to control the carrying trade of the petroleum oil business. The company was chartered by the Pennsylvania Legislature in 1870, with a nominal capital of $10,000,000. During 1871 the co-operation of the four great trunk lines—the Pennsylvania, the Erie, the New York Central, and the Baltimore and Ohio Companies—was secured by an agreement on the following basis:

The Erie and New York Central Railways to be awarded each 27½ per cent., and the Pennsylvania Central, including the Baltimore and Ohio interest, 45 per cent. of the addition to the freight tariff over the old ratios, which exaction was to be rendered possible by the consolidation.

The first advance in freights was made two months ago, and on the 1st of February another advance was announced. Thus far no decided opposition was made; but when, last Monday, a still further increase took place, the opposition began in earnest. The following table shows the present situation:

	Oil in barrels—		Oil in bulk—	
	Old Tariff.	N. Tariff.	Old Tariff.	N. Tariff.
To New York.....	$1 65	$2 84	$1 31	$2 48
To Boston.....	1 89	2 99	1 45	2 63

The Cleveland and Pittsburgh refiners, who are connected with the monopoly, receive a drawback of $1 per barrel, while refined oil from Titusville must now pay a freight charge of more than two and a half cents a gallon, or $1 16 to $1 18 per barrel more than before. The railroad companies get an excellent profit on the oil sent eastward from the refineries of the association, while the extra tariff is literally extorted from the refineries of the Titusville region.

The Southern Improvement Company having obtained absolute control of the entire oil-producing district, can buy oil on its own account, and, by creating a scarcity of the product in the eastern market, so enhance the price as to secure an enormous profit in addition to the extravagant overcharge for freight.

The oil dealers of this city, who denounce the monopoly in the strongest terms, met yesterday afternoon, and appointed a committee of three to meet representatives of the Southern Improvement Company, and a committee of two to confer with oil purchasers. Another meeting will be held this afternoon.—*Evening Post.*

Gas in New York.

To the Editor of the New York Times.

Believing that in your connection with the public as journalist you have been actuated by motives of the general welfare, and that any corruption or oppression would meet with your unqualified and energetic denunciation, I am strengthened in my desire to call your attention to the great evil in our city.

The public feel the oppression of the gas monopolists, but the great body being little versed in scientific questions, do not fully understand how deeply wronged they in reality are.

I have investigated to a certain extent the art of gas production, the price, quantity, etc., in different cities, and I desire to call your attention to some items that will interest a great number of your readers.

Gas is furnished in Philadelphia "about eighteen candles" at $1 50 a thousand feet; any supposed errors in quantity are respectfully investigated, and if ascertained to be such, are in a gentlemanly manner redressed; gas is furnished in Pittsburg at 80 cents per thousand feet. Even the citizens of Ring-ridden Brooklyn are only mulcted $2 50 per thousand feet. Manchester, Birmingham, Liverpool and London pay from 2s. 6d. to 3s. 4d. per thousand feet for splendid gas, ranging in quality from 20 to 25 candles illuminating power. One of the best informed and most respectable gentlemen ever connected with the Manhattan Gas Company, in fact the chief constructer and superintendent of their works, wealthy and retired from active life, informed me that he believed, and could demonstrate, that the Manhattan Gas Company could furnish better gas than has been their custom for less than one dollar per thousand, and pay current expenses and fair dividends; they charge $3 for the most miserable stuff we are now using. The Metropolitan charge fifty cents more than the Manhattan and their gas is worse, if possible, than that of the former; and this, when it is known that the last-named company was established as a competitor of the Manhattan, and made all sorts of promises to the citizens and to the Legislature to obtain their charter, shows that to make it a matter of conscience to woman as to what quantity of ribbon she will take if left to measure it herself, as a shilling's worth, are very weak restrictions upon a gas monopoly or any such institution. I will conclude by giving a few facts elicited before the Assembly Committee on Municipal Affairs, 1868-69, Assembly document No. 116, Hon. Peter Mitchell, chairman. I will first commence with the Manhattan Gas Company. This company abandoned their charter two years ago. Why did they abandon their charter? Simply because they were restricted in the price they should charge consumers for gas. By their charter they were only allowed to charge $2 per thousand; they abandoned their charter, in order that they might charge $3 per thousand feet. The committee witnessed a test made by an eminent chemist, and found their gas to be less than 13 candles. In 1864 this company charged the city for street lamps $28 80 each; on page 109 of the printed matter, Mr. Roome, President, testifies that they now charge the city $53 per lamp. When they abandoned their charter, two years ago, and raised the price of gas, they issued $2,000,000 of certificates of indebtedness, on which they pay seven per cent. interest annually, besides paying a good dividend on their regular stock of four millions of capital. The property this company owns is worth probably $8,000,000, and yet their capital stock is only $4,000,000. And you could not buy their stock at any price; that $4,000,000 worth of stock could not be bought for $16,000,000."

WM. E. DEMAREST,
No. 25 West Thirty-third street.

Obituary.

COL. AMBROSE J. WHITE.

Col. Ambrose J. White, late engineer of the Peoples Gas Light Company of Brooklyn, N. Y., died at his residence on Sunday, the 25th of February last.

In the death of this accomplished engineer and most genial gentleman, the gas fraternity has sustained an almost irreparable loss, for, since the death of the lamented Sabbaton, none has so worthily filled his place; his advice and judgement having been universally sought, because of his professional acquirements and unblemished integrity of character.

For the past thirty-five years his time had been devoted to the study of Mechanics, and the subject of Gas Engineering. During this period he had constructed the works at Petersburgh, Va.; Charlottsville, Va.; Macon, Ga.; Clarksville, Tenn.; Paducah, Ky.; St. Paul Minn., and many other works at the south and west; during this period, also, he was for a time the successful agent of Messrs. Code, Hopper & Gratz, meter manufacturers of Philadelphia.

In 1862 he came to New York, as one of the constructing engineers of the Metropolitan Gas Works, and on their completion was elected chief engineer of the company, which position he held until the spring of 1869; when, upon his resignation, he assumed position as constructing engineer of the Peoples Works of Brooklyn, accepting the position of engineer in charge when the company began operations. At the time of his death he was preparing to go to St. Louis, to construct the works of the Laclede Gas Light Company.

Col. White was the honored associate, and valued correspondent of all the most eminent engineers in the profession; being of a progressive turn of mind he was ever ready to thoroughly investigate the merits of any substantial improvement in the manufacture of gas.

Col. White's frank and generous nature was widely known and universally appreciated; and few have been laid in their last resting place, whose memory will be held in more affectionate regard.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—ED.

Gas Explosion.

NEW YORK, March 5th, 1872.

Mr. Editor: An explosion occurred in the purifying house of our gas works recently, which blew out the doors and windows, raised the roof, and deposited it in pieces at some distance away, and demolished the upper part of the walls. After an examination the contents of the house, the purifiers, center seal, meter prover, all the pipes were found in good order, and no leak could be discovered. One of the men had left the spot a short time before, not having noticed any escape of gas. A trap door to the cellar was open and some boards up in another spot.

There was also a barrel of 85° naphtha, styled non-explosive, standing there, into which a short time before, some of the same material had been transferred, having been taken from another barrel by means of a dipper, and poured in through a funnel in the bung hole. A process of blowing air through said naphtha was being used; the pipe conducting same entering pipe leading to the holder beyond the center seal. A powerful steam blower was used for the purpose. These are the facts. Cany any among your numerous scientific and practical readers suggest the origin of the explosion?

Respectfully yours,
NAPHTHA.

Propelling Balloons by Gas Engines.

Concerning reports of recent German aeronautical experiments, M. Hubert has addressed a note to the French Academy, from which we extract:

"That journal (the *Faxette* of Frankfort) says: We have assisted the experiments made in the *Halle aux Blis* with a model made by the inventor, and the result was most satisfactory. It has proved to us that an aerial ship can be steered. The construction is thoroughly new and original in this, that a gas motor is employed to maintain in motion an aerial screw, in such manner that the motor is fed from the balloon filled with gas. In consequence, it has neither furnace nor coal receptacle. The trials demonstrated that the machine could fly either in a right line or in a circle. The model moved rapidly, and on a large scale would doubtless have done so in a much greater degree, especially if the balloon be inflated not by the aid of gas from oil, but with hydrogen, which, being lighter and more powerful, will augment the carrying capacity of the balloon and the power of the motor.

"In several memoirs to the Academy, I have developed the principle that the necessary force to guide the balloon in any direction should be produced by the aid of two elements constantly carried by the aeronaut; gas the same as of the balloon itself, and the air. Furthermore, I have shown it possible to completely suppress ballast in utilizing the heat lost by the consumed gas as it leaves the cylinder of the machine, after having produced its effect on the piston. This result is obtained by an arrangement analogous to the condenser of Watt's steam engine. By different combinations comprised in the invention as a whole. I arrive at the double result; the obtention of relatively the greatest motive force possible—six horse-power indicated—and the reduction of the burden of the balloon to a minimum extremely low."—*Am. Artisan from Las Mondes.*

The Newark Water Works have been completed at a cost of $1,750,000. The works are capable of furnishing a supply of 10,000,000 gallons of water every twenty-four hours.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 91, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS and other buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity, Retort Settings, Condensers, Washers, Exhausters, Purifiers, Holders, Coal Hoisting Apparatus, Iron Roofs, and every description of Machinery required in the Manufacturing of Gas.

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Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Blowers for Forgers,
Pumps for Water, &c., &c.

REFERENCES:

CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
SAMUEL DOWN, President American Meter Company, N. Y.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
CHARLES MOWTON, Engineer New York Gas-Light Company, N. Y.
SAMUEL P. PARHAM, Engineer Mutual Gas-Light Company, N. Y.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL.
HENRY J. DAVISON, Engineer, 77 Liberty Street, N. Y.
HERRING & FLOYD, Oregon Iron Foundry, 788 Greenwich Street, N. Y.
FREDERICK SABBATON, Engineer Troy Gas-Light Company, Troy, N. Y.
Col. WHITE, Engineer People's Gas-Light Company, Williamsburgh, N. Y.
GEORGE W. PARSONS, Sup't and Eng'r. Rochester Gas-Light Co., Rochester, N. Y.
GEORGE W. EDGE, Engineer, Jersey City Gas-Light Co., Jersey City, N. J.
J. H. GAUTIER & Co., Fire Brick Works, Jersey City, N. J.
Professor SILLIMAN, New Haven, Conn.
JOHN HARRISON, Engineer People's Gas-Light Company, Baltimore, Md.
CHARLES FABEN, Superintendent and Engineer Toledo Gas-Light Co., Toledo, O.
PETER F. BURTIS, Supt. and Engineer, Chicago Gas-Light Co., Chicago, Ill.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [351-

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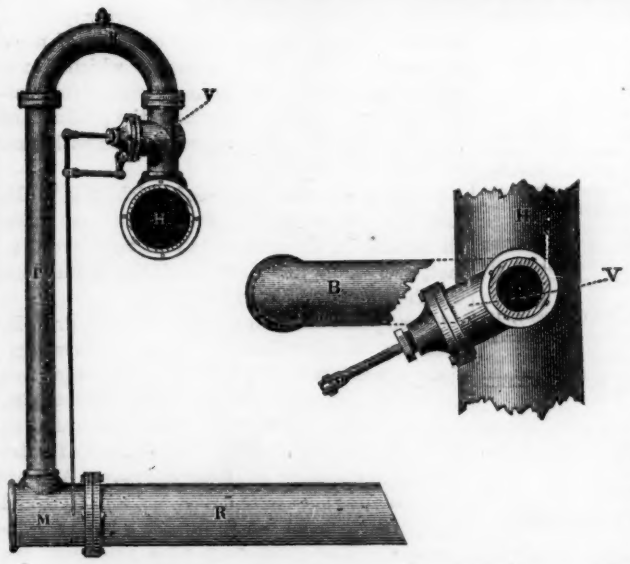

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MR. P. MUNZINGER, Gas Engineer, has been connected with our Establishment as Engineer and Designer, and in charge of the Gas Works Department for the past fifteen years.

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Easton, Pa.
Lancaster, Pa.
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Uniontown, Pa.
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Hudson City, N. J.
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Metropolitan Works, N. Y. City.
Binghamton, N. Y.
Rome, N. Y.
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Elmira, N. Y.
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Flat Bush, N. Y.
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Batavia, N. Y.
Fredonia, N. Y.
Columbus, Ohio.
Mansfield, Ohio.
People's Works, Cleveland, Ohio
Newark, Ohio.
Salem, Ohio.
Wooster, Ohio.
People's Works, Chicago, Ill.
Chicago Gas-Light and Coke Co., Ill.
Jacksonville, Ill.
Peoria, Ill.
National Asylum for Discharged Volunteer Soldiers, Milwaukee, Wis.

Detroit, Mich.
La Porte, Ind.
Lawrence, Kansas.
Salem, Oregon.
Port-au Prince, Cal.
San Jose, Cal.
Stockton, Cal.
Illinois State Penitentiary, Joliet.
Hartford, Conn.
Hagerstown, Md.
Peoples Works, Baltimore, Md.
Elkton, Md
Milledgeville, Ga.
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New Orleans, La.
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Houston, Texas.
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☞ See page 4 for Index to Advertisements.